

A NEW APLACOPHORAN FROM NEW ZEALAND

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Plate 5

SUMMARY

A new species of the Aplacophora, *Proneomenia quincarinata*, is described from New Zealand. The anatomy, radula and spicules place this species in *Proneomenia*, but it differs from all other members of the genus in having five longitudinal folds. This is the first aplacophoran to be recorded from New Zealand.

INTRODUCTION

Records of the class Aplacophora in the South and West Pacific are few, probably because these animals are scant in this area, but also because there has been little interest shown in the group by local workers. Nierstrasz (1902), Thiele (1902), Heath (1911) and Thiele (1897) cover species from the Indonesian Archipelago, Zanzibar, Hawaiian Islands and northern Australia respectively. Antarctic expeditions have not recorded any species from the Subantarctic, although Pelseneer (1903) and Nierstrasz (1908) each describe one species from the Antarctic and Thiele (1913a) describes 13 species. No species have been previously described from New Zealand.

The material on which the new species is based consists of 3 specimens collected from two localities. All of the specimens were preserved in 70% alcohol when collected so that their state of preservation was not good enough for histological work, or even very detailed anatomy. The determination of diffuse glandular masses and fine structures was difficult and often impossible. Thus only the gross anatomy is presented here, and this proves to be sufficient to determine the systematic position of the species.

Two specimens were dissected dorsally and laterally, and longitudinal and transverse slices were made to supplement the results of dissection. The third specimen was left intact and has been designated the holotype. All of the material, including the radular slide, has been housed in the Dominion Museum, Wellington, New Zealand.

DESCRIPTION

Family Proneomeniidae

Genus *Proneomenia* Hubrecht, 1880, *Zool. Anz.*, 3: 589.

Type species: *Proneomenia sluiteri* Hubrecht (1880).

Proneomenia quincarinata sp. nov.

Figures 1-14

Diagnosis. Animal vermiform, up to 52 mm in length, with small, slit-like openings ventrally at anterior and posterior ends. Five longitudinal ridges run the length of the body. Spicules on body straight, simple; some cloacal spicules hooked. Radula with two rows of large, unicuspid central teeth, and about 19 weakly-chitinized lateral teeth. Shell glands paired,

with separate openings into cloacal chamber. Seminal receptacle apparently represented by a strip of simple follicles along dorsal edge of shell glands. Copulation spiculæ present.

External Features and Pedal Groove. The animal is elongate, bluntly pointed posteriorly and rounded anteriorly. It is slightly wider on the anterior half of the body and has five longitudinal rounded ridges (Fig. 14). These ridges consist of a median dorsal ridge and two symmetrically placed lateral ridges on either side. The lowest pair of ridges terminate just in front of the cloacal opening but the others extend to the extreme ends of the body (Fig. 5, 6). The pedal groove is represented externally by a rather inconspicuous furrow extending from the mouth to the cloacal opening (Fig. 1). The living animal was yellowish-pink, but the preserved specimens have bleached to a yellowish-white.

Immediately behind the mouth lies the pedal pit (Fig. 11; pp), a round, thick-walled chamber with laterally compressed walls. This pit receives the pedal groove at its posterior side. The pedal groove is a tightly closed slit containing a single, short fold (Fig. 14; fp). A thick band of longitudinal muscle (Fig. 14; lm) lies on either side of the inner part of this slit and above this is a thinner layer of circular muscle (Fig. 14; cm). These muscles form a very thin sheath on the inside of the remainder of the body wall.

The cloacal opening (Fig. 12; ca) is more widely open than the mouth in the preserved material and receives the pedal groove at its anterior end.

The body spicules (Fig. 9) are straight, hollow tubes, pointed at both ends and variable in size. The largest reach a length of about 0.04 mm. There does not seem to be any regional differentiation apart from a hooked type that occurs in the cloacal aperture (Fig. 10). The spicules form an intertwined mass which forms the thick outer integument of the body.

Alimentary Canal. The mouth opens into a cavity which is divided into two sections. The narrow posterior portion receives the pharynx and is separated from the large, sac-like anterior section or vestibule (Fig. 11; v), by a pair of thick, pleated (glandular?) ridges which run backwards ventro-laterally and then dorsally thus forming the posterior limit of the vestibule. They then run forwards across the vestibular roof. The lateral faces of the vestibule are made up of very numerous, minute, close-packed villi.

The muscular pharynx (Fig. 11, 13; ph) is initially longitudinally ridged but over most of its length is transversely folded (due to contraction). Its walls are muscular and at its posterior end a sudden constriction is formed by a pair of cuticle-lined lips (Fig. 11; cl), behind which lies the radula. The short radular sac (Fig. 11, 13; rs) lies above a muscular odontophore containing a hollow, cartilaginous bulb (Fig. 11; cb) to which are attached a complex series of muscles. A pair of slender retractor muscles (Fig. 11; rm) extend behind the odontophore and become embedded in the latero-ventral body wall. There is no subradular organ such as described in two species of *Proneomenia* by Heath (1904, 1918).

The radula (Fig. 7) is of the polystich type (Nierstrasz, 1905), consisting of about 18 rows of teeth, about 40 teeth in each row. There is a double row of large, alternating central teeth which have a long base

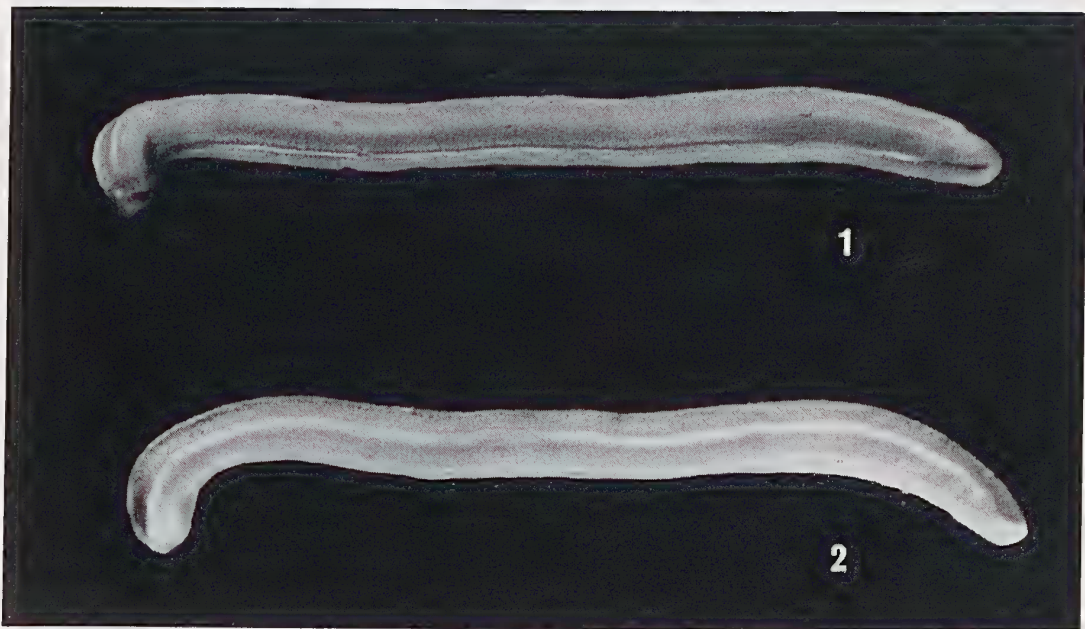


PLATE 5.

Fig. 1-2. The holotype of *Proneomenia quincarinata*, showing latero-ventral (Fig. 1) and lateral (Fig. 2) views of the whole animal. Photo: A. Healy.

and a single, hooked cusp. The lateral teeth are very weakly chitinized, undifferentiated, small and slender, and with slightly flanged bases in side view. There are about 19 laterals on each side and they are probably functionless.

After looping forward, the long, paired salivary glands (Fig. 11, 13, 14; sg) open into the buccal cavity at the side of the radula. These glands run ventrally and terminate a little in front of the cloacal cavity. There is no definite indication of a dorsal salivary gland although some diffuse glandular material is present around the pharynx.

Immediately above the odontophore opens the short oesophagus (Fig. 11, 13; os). This bends forward over the radular mass and opens into the mid-gut (Fig. 11; mg). Its walls are made up of thick, mainly longitudinal, muscles and its position presumably facilitates the evagination of the odontophore from the mouth. At the distal end of the oesophagus the walls are continuous with a series of lateral muscles which radiate out towards the body walls in an anterior and posterior series (Fig. 13; ram).

A mid-gut caecum (Fig. 11; mgc) extends, in the usual fashion for this group, over the pharynx. The thin walls of the mid-gut contains massive lateral glandular pouches (Fig. 12, 14; mgg) throughout its length. A very short rectum (Fig. 12; rt) opens dorsally into the cloacal chamber.

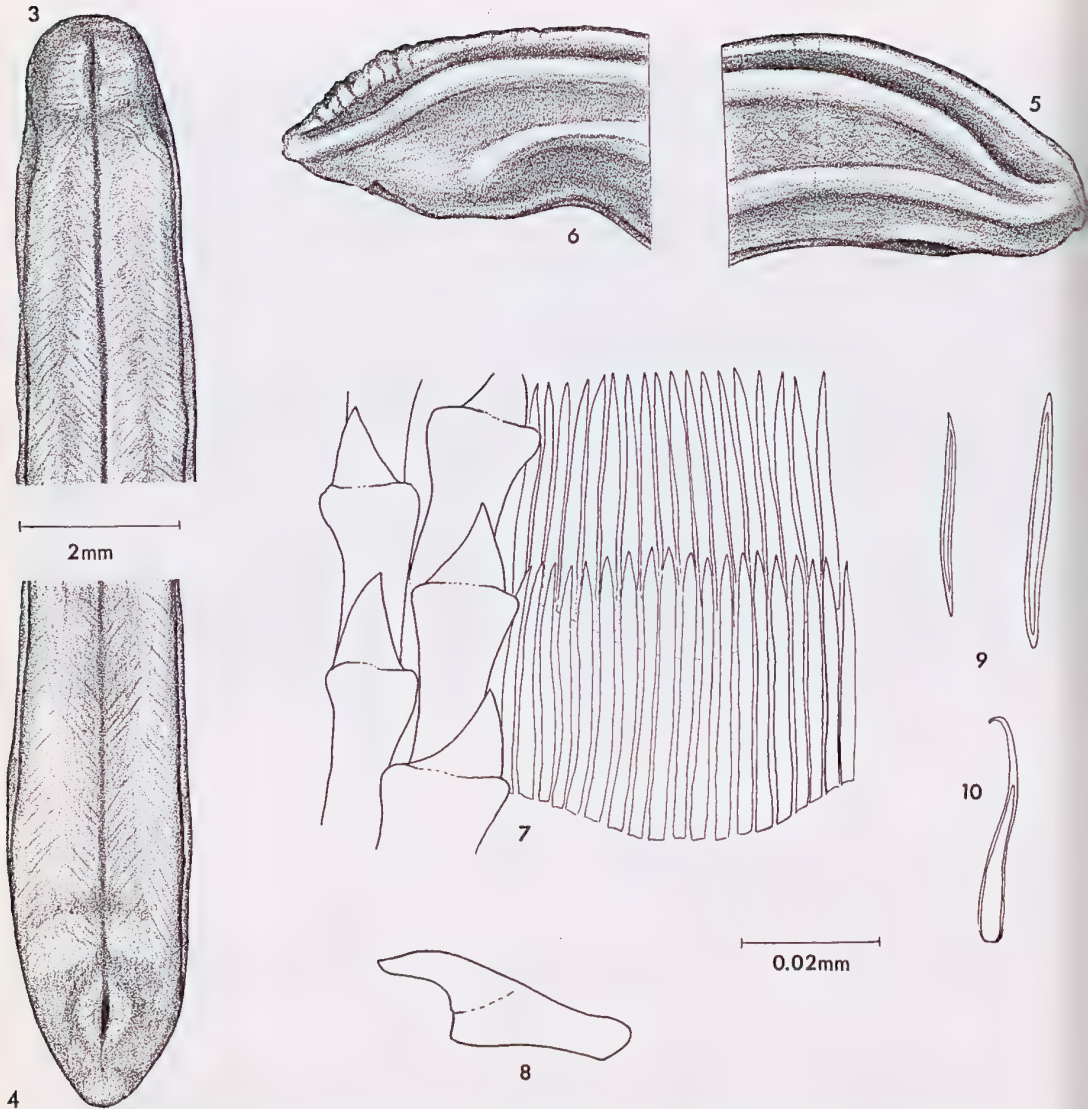


Fig. 3-10. *Proneomenia quincarinata*. 3, ventral view of anterior end of the paratype from the Chatham Islands. 4, ventral view of the posterior end of the same specimen. 5, lateral view of the anterior end of the paratype from Lyall Bay. 6, lateral view of the posterior end of the same specimen. 7, portion of the radula of the Lyall Bay specimen showing two rows of marginal teeth on the right. 8, lateral view of a central tooth. 9, body spicules of the Lyall Bay specimen. 10, a cloacal spicule from the same specimen.

The cloaca (Fig. 12) consists of a thin-walled sac into which the rectum and a pair of shell glands open, and a slit-like opening provides access to the exterior. The cloacal chamber extends behind the opening for about the same distance as the length of the external opening. Impinging laterally on the walls of the chamber are the shell glands, and a pair of thick (glandular?) plates (Fig. 12; dp) are attached dorsally

and hang vertically into the chamber immediately behind the cloacal opening. The anus opens between the postero-dorsal ends of these plates.

Reproductive System. The large, paired gonads (Fig. 11, 12, 14; g) lie dorsally immediately above the lumen of the mid-gut and between the dorsal exterior of the mid-gut glands. A very short, wide gonopericardial canal (Fig. 12; gp) enters the pericardium (Fig. 12; p) which lies dorsally over the posterior end of the gut. The gonoducts are extremely delicate, transparent structures and consequently difficult to trace. They appear to run almost directly to the posterior end of the shell glands (Fig. 12; sgl), a pair of massive bodies lying on either side of the cloacal chamber. Immediately behind each shell gland is a small, thick-walled bulb, the copulation spicule bulb (Fig. 12; csb). Each bulb is fixed by a ring of very short muscles to a narrow tube lying along the inside latero-ventral wall of the shell gland — i.e. between the shell gland and the cloacal chamber. This tube opens immediately inside the slit-like opening of the shell gland to the dorsal chamber (Fig. 12; sga). The outer latero-ventral and posterior walls of the shell glands are clothed with a complex series of radiating muscles that serve to operate the copulation spicule apparatus. They consist of an anterior set of retractor muscles (Fig. 12; rm) which are largely attached to the shell glands and latero-ventral body wall, a stronger posterior group of protractor muscles (Fig. 12; pm) attached to the bulbs and fixed to the body wall and shell glands, and a pair of strap-like retractor muscles attached to both bulbs and attached ventrally to the body wall. Another strap-like muscle runs forward ventrally from each bulb forming the ventral protractor muscles.

There is no separate seminal receptacle but the shell glands have a slit along the entire glandular dorsal wall and these each communicate with a rather diffuse, external strip of (follicular?) tissue (Fig. 12; f). There is no evidence that this tissue does, in fact, have a sperm storing function.

The nervous and vascular systems could not be investigated with the material available.

Type Material.

Holotype and paratype 1: 44°04' S, 175°23.5' E, east of the Forty Fours, Chatham Islands, east of New Zealand, in 130 fathoms. 1 Feb. 1954. (Station 34 of the 1954 Chatham Islands Expedition).

Holotype, M23193. Length: 31mm; diameters: 2.0mm (middle of body)
2.3mm (immediately behind mouth)
2.1mm (immediately in front of cloaca)

Paratype 1, M23194. Length: 30mm; diameters: 2.1mm (5mm in front of centre of body)
1.9mm (5mm behind centre of body).

Paratype 2, M23195. Off Lyall Bay, Wellington, Cook Strait, in 8 fathoms. In a pocket of sand amongst rocks. Coll. S. G. Hulme, 1962.

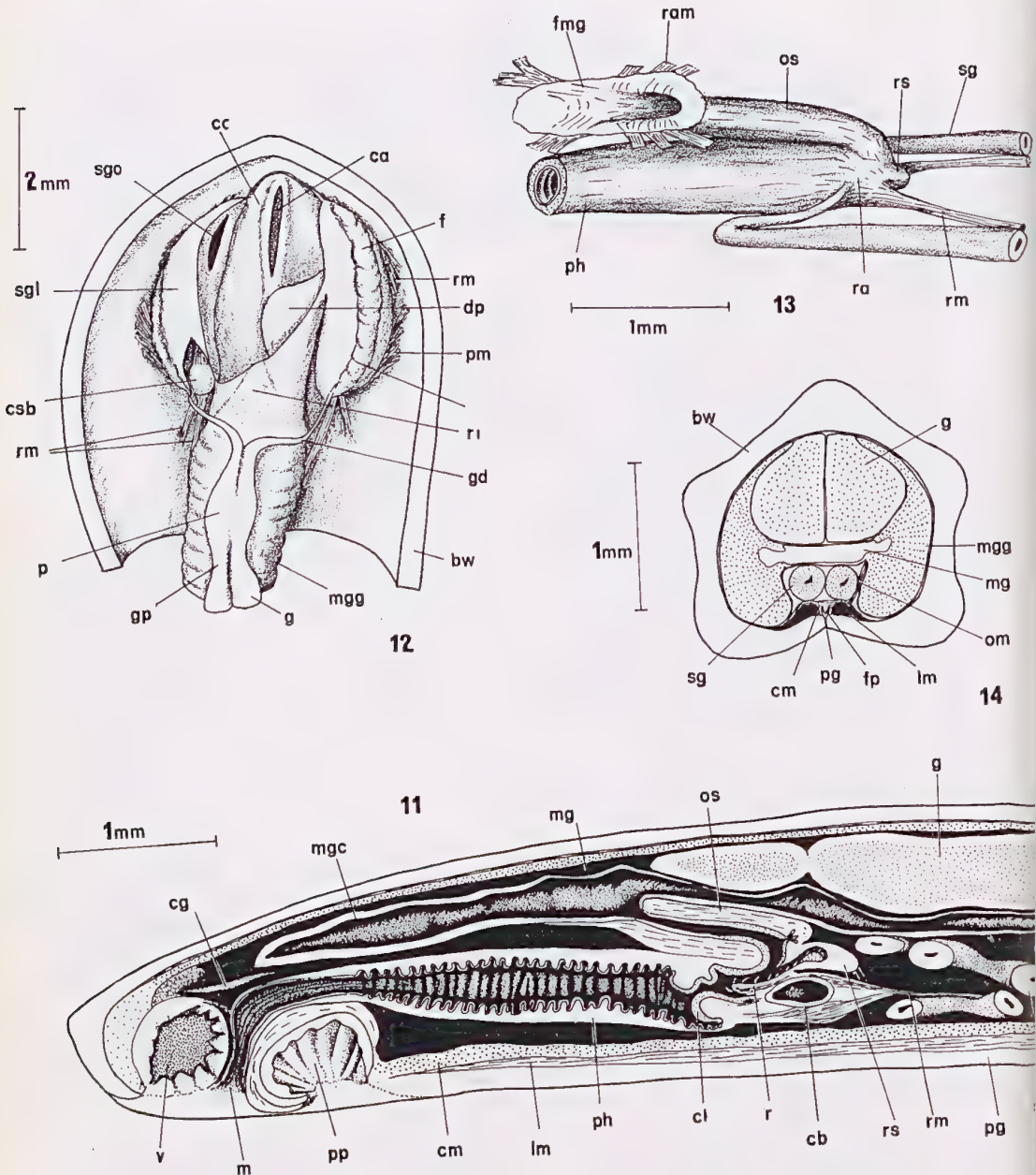


Fig. 11-14. *Proneomenia quincarinata*. 11, semidiagrammatic median, vertical longitudinal section through the anterior end of the Chatham Island paratype. 12, posterior end of the Lyall Bay paratype dissected dorsally. The roof of the cloacal cavity and the left dorsal leaf has been removed. The left shell gland has been split to show the copulation spicule bulb beneath it. 13, posterior part of the pharynx, the oesophagus, the radular apparatus and the anterior portion of the salivary glands dissected from the Lyall Bay paratype; the mit-gut has been removed except for a portion of its floor. 14, semidiagrammatic transverse section of the Chatham Island paratype taken about 5mm behind the centre of the body.

A N.Z. Aplacophoran

Length: 52mm; diameters: 2.5mm (8mm behind anterior end of body)
 2.1mm (6mm in front of posterior end of body)
 2.5mm (middle of body)

DISCUSSION

Most species of *Proneomenia* are evenly rounded in section but the Antarctic *P. tricarinata* Thiele (1913a) has three longitudinal ridges. Thiele's species is also similar to *quincarinata* in the general appearance of the radula, although the marginal teeth in the Antarctic species are stronger and different in shape. The genital organs also separate the two species because the shell glands of *tricarinata* join before reaching the cloaca and the Antarctic species has prominent, rounded seminal receptacles attached by a narrow duct.

The radula and the longitudinal folds on the body of *tricarinata* and *quincarinata* are somewhat atypical of *Proneomenia* but in most other features they agree with the genus as defined by Heath (1911) and Thiele (1913b). Another unusual feature of the new species is the presence of the two dorsal plate-like structures. If these were interpreted as gills it may result in *quincarinata* being removed from *Proneomenia*. The lack of separate seminal receptacles in *quincarinata* is certainly unusual, but further discussion on this point should await histological investigation.

Hyman (1967, p.68) gives the shallowest depth recorded for an aplacophoran as 18 metres. The specimen of *P. quincarinata* from Lyall Bay in 8 fathoms was found (allowing for some error) at about the minimum depth recorded for the class. The depth range of the new species is at least 8 - 130 fathoms and it is reasonable to assume that it extends beyond both these limits. Such a range of depth and locality (Chatham Islands to Cook Strait) suggests that *P. quincarinata* may be widely distributed around New Zealand.

Nothing is known of the habits of the new species except that it is likely that it burrows into sand or mud.

This species is the first recorded from Southern Australasia in recent literature, but it is probable that with careful searching additional species of this fascinating group will be found.

ACKNOWLEDGEMENTS

I am grateful to Dr. R. K. Dell for generously allowing me to work on the material on which this species is based. A tribute must be paid to the late Mr. S. G. Hulme who first discovered this species and would have described it if it were not for his untimely death. Mr. Anthony Healy kindly took the photographs for Figures 1-2.

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ABBREVIATIONS

- | | |
|----------------------------------|----------------------------|
| bw — body wall | mgg — mid-gut gland |
| ca — cloacal aperture | om — oblique muscle |
| cb — cartilaginous bulb | os — oesophagus |
| cc — cloacal cavity | p — pericardium |
| cg — cerebral ganglion | pg — pedal groove |
| cl — cuticle-lined lip | ph — pharynx |
| cm — circular muscle | pm — protractor muscle |
| csb — copulation spicule bulb | pp — pedal pit |
| dp — dorsal plate-like structure | r — radula |
| f — dorsal follicular structures | ra — radular apparatus |
| fmg — floor of mid-gut | ram — radiating muscle |
| fp — fold in pedal groove | rm — retractor muscle |
| g — gonad | rs — radular sac |
| gd — gonoduct | rt — rectum |
| gp — gonopericardial canal | sg — salivary gland |
| lm — longitudinal muscle | sgl — shell gland |
| m — mouth | sga — shell gland aperture |
| mg — mid-gut | v — vestibule |
| mgc — mid-gut caecum | |